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The Richtmyer-Meshkov Instability in Cylindrical Geometry: Experiments and Simulation

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The Richtmyer-Meshkov Instability in Cylindrical Geometry: Experiments and Simulation

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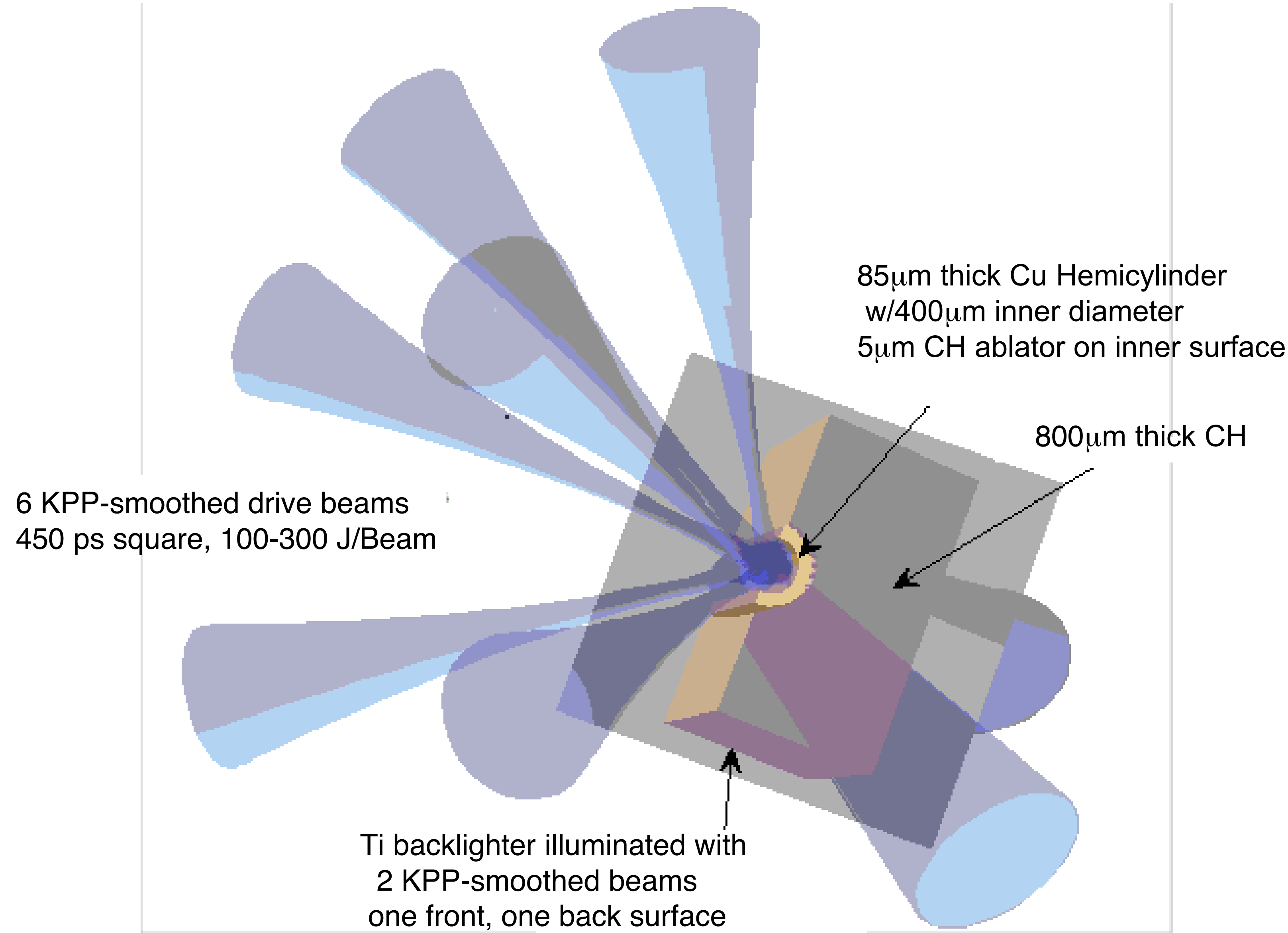
Outline

- Motivation/Objective of study
- Experimental setup
- Method of solution
- Preliminary results
- Conclusion

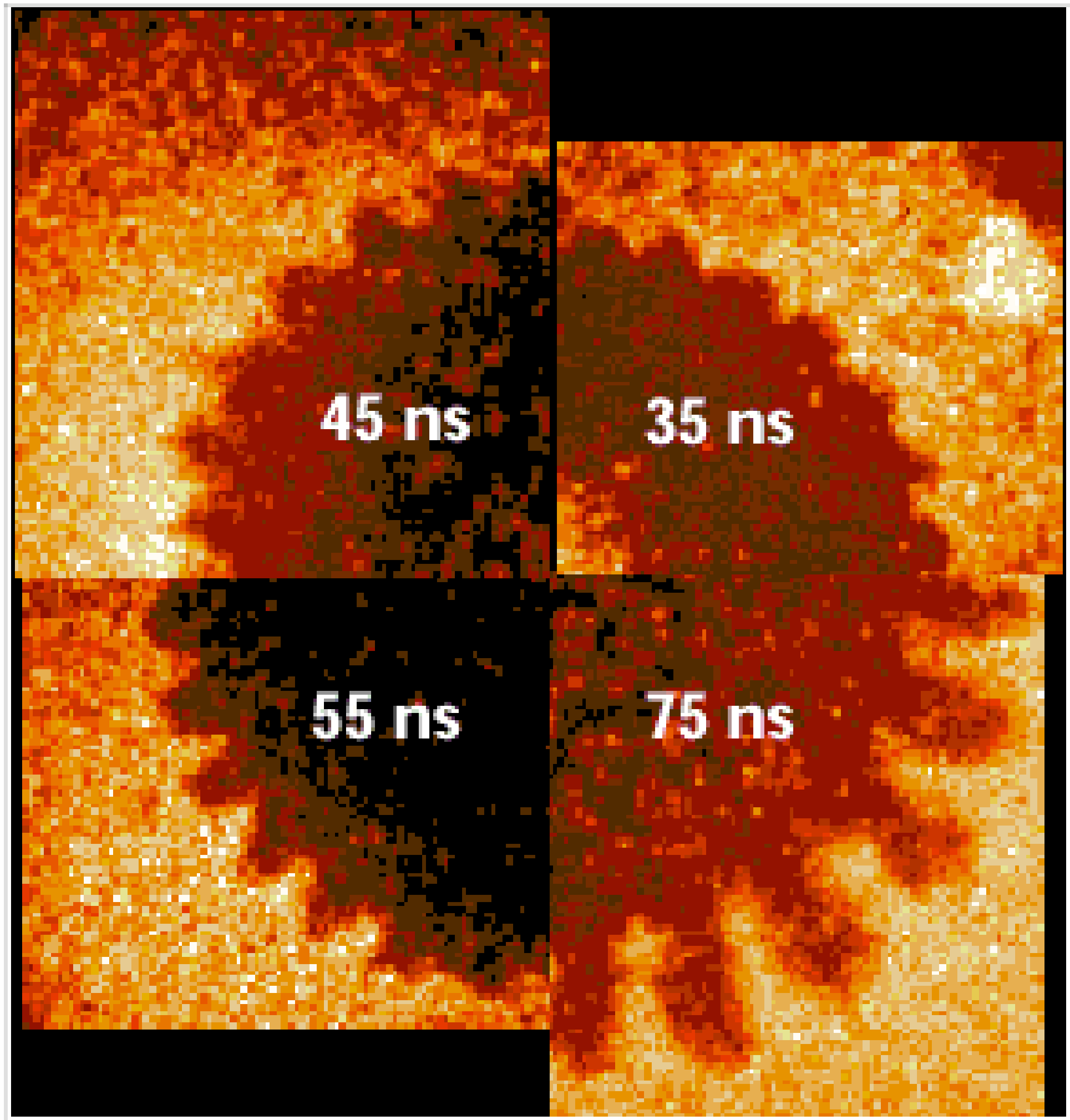
Experimental configuration for the DIVRM



Radiographs of the instability evolution

Shot 29012006
404.98J

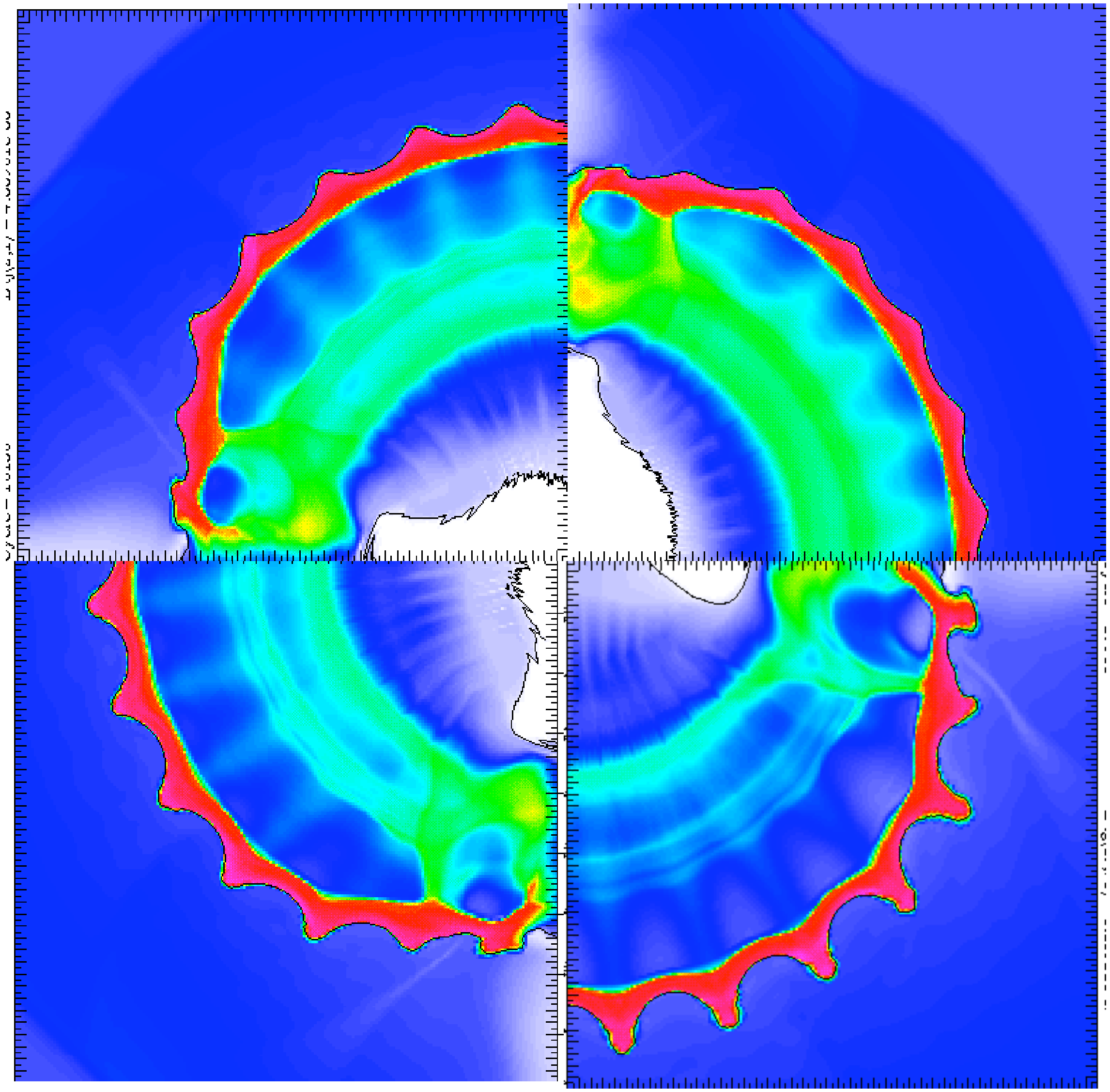
Shot 29012003
495.37J



Shot 29012011
493.69J

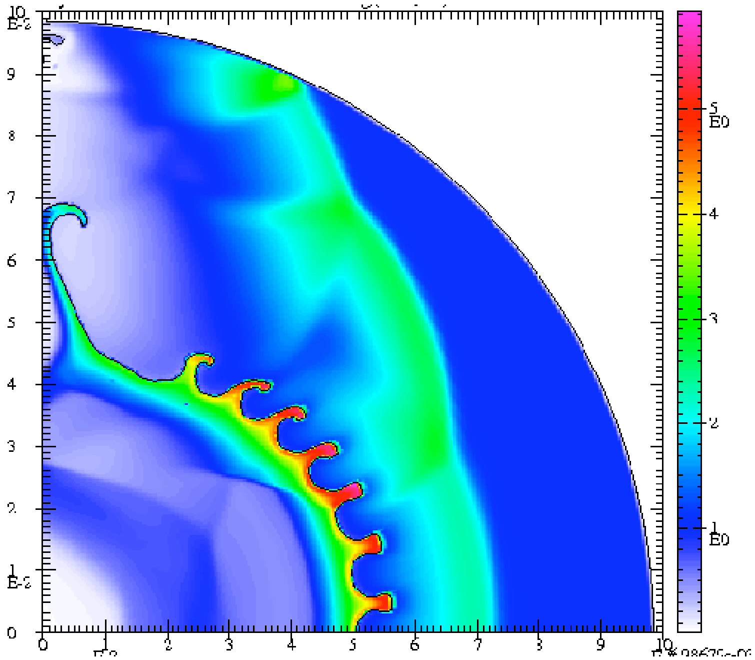
Shot 29012003
1714.00J

Evolution of the DIVRM (density distribution)



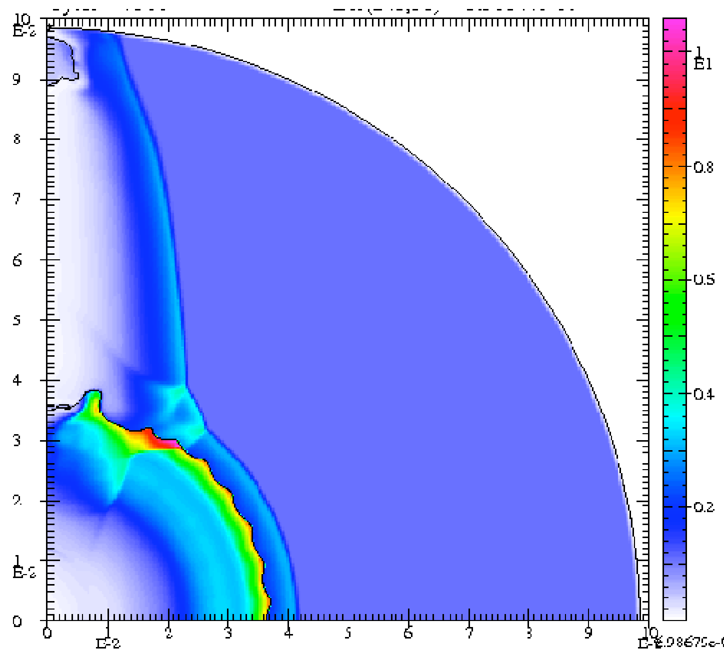
Evolution of the DIVRM (density distribution)

Shot 29012003
495.37J 35ns



overestimate amplitude
radiograph time (58 μm)

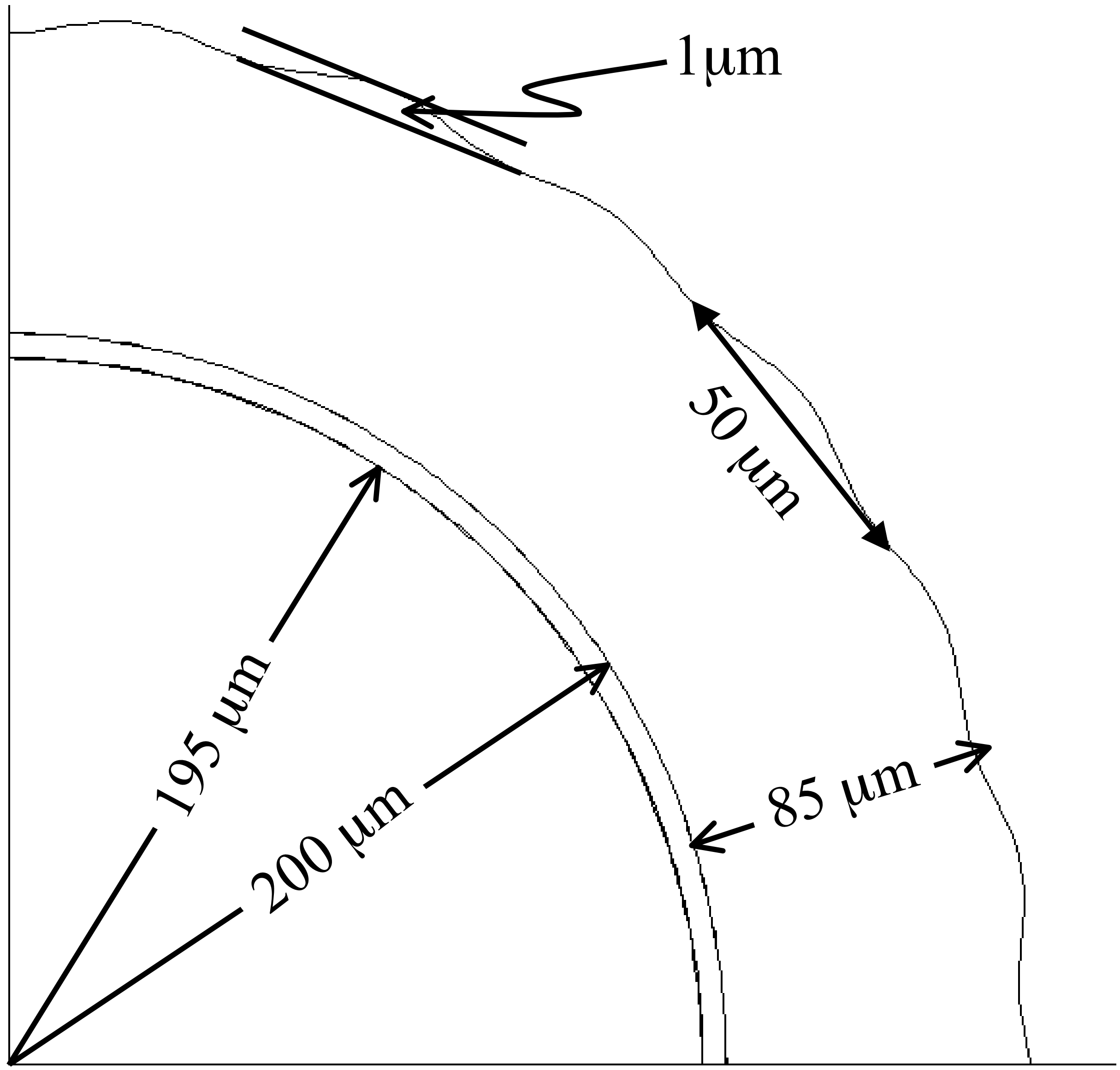
Shot 29012003
495.37J 353μm



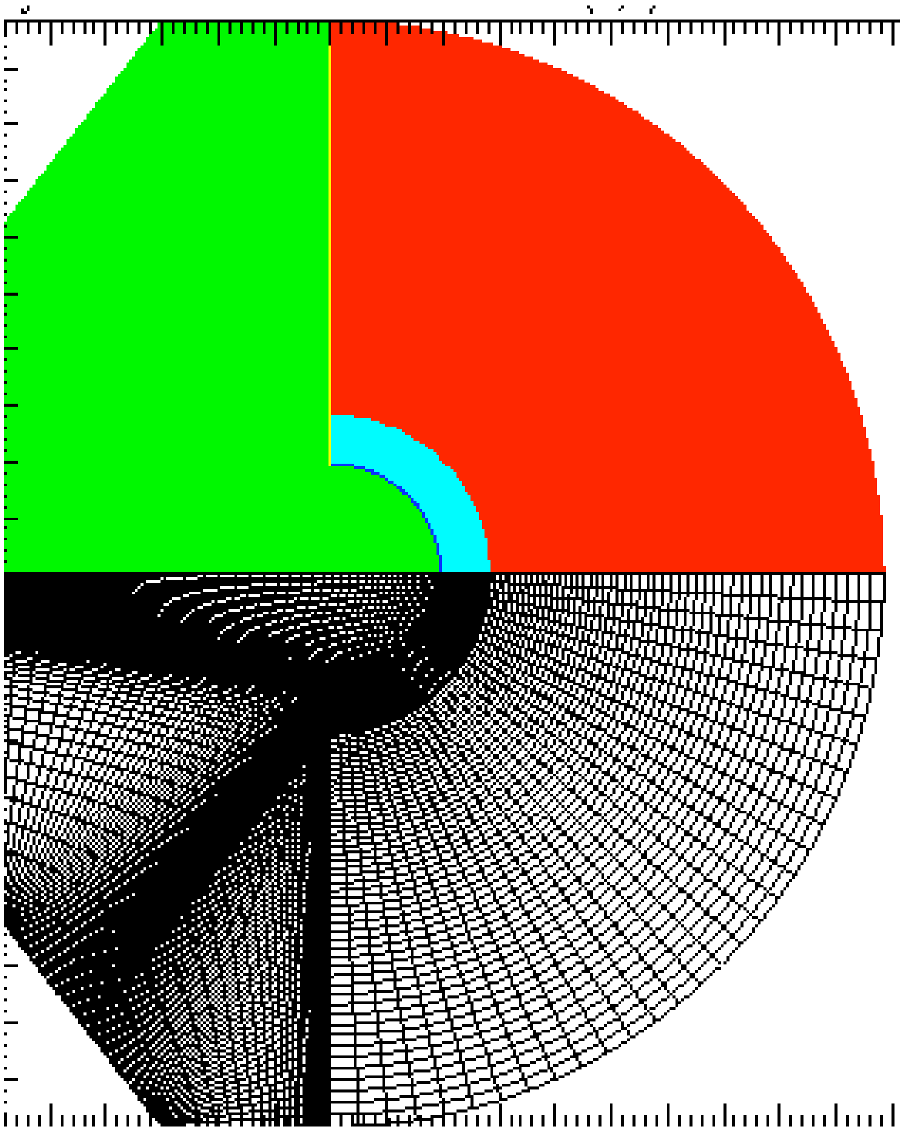
underestimate amplitude at average
position radiograph time (6.5 microns)

PV amplitude 23.1μ m

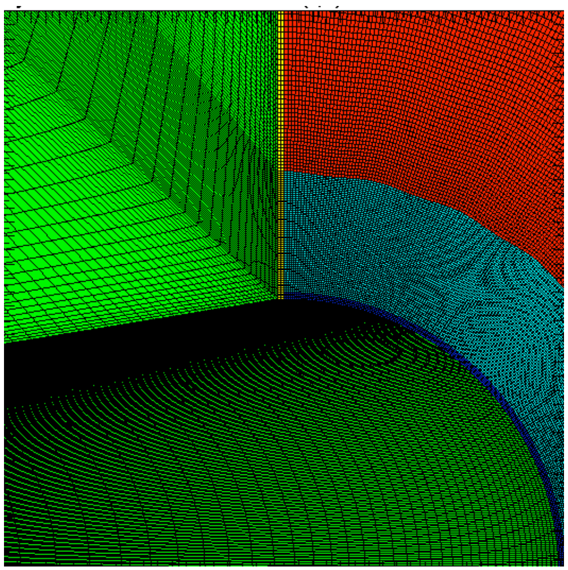
Schematic of the initial interface



Material regions and initial mesh.

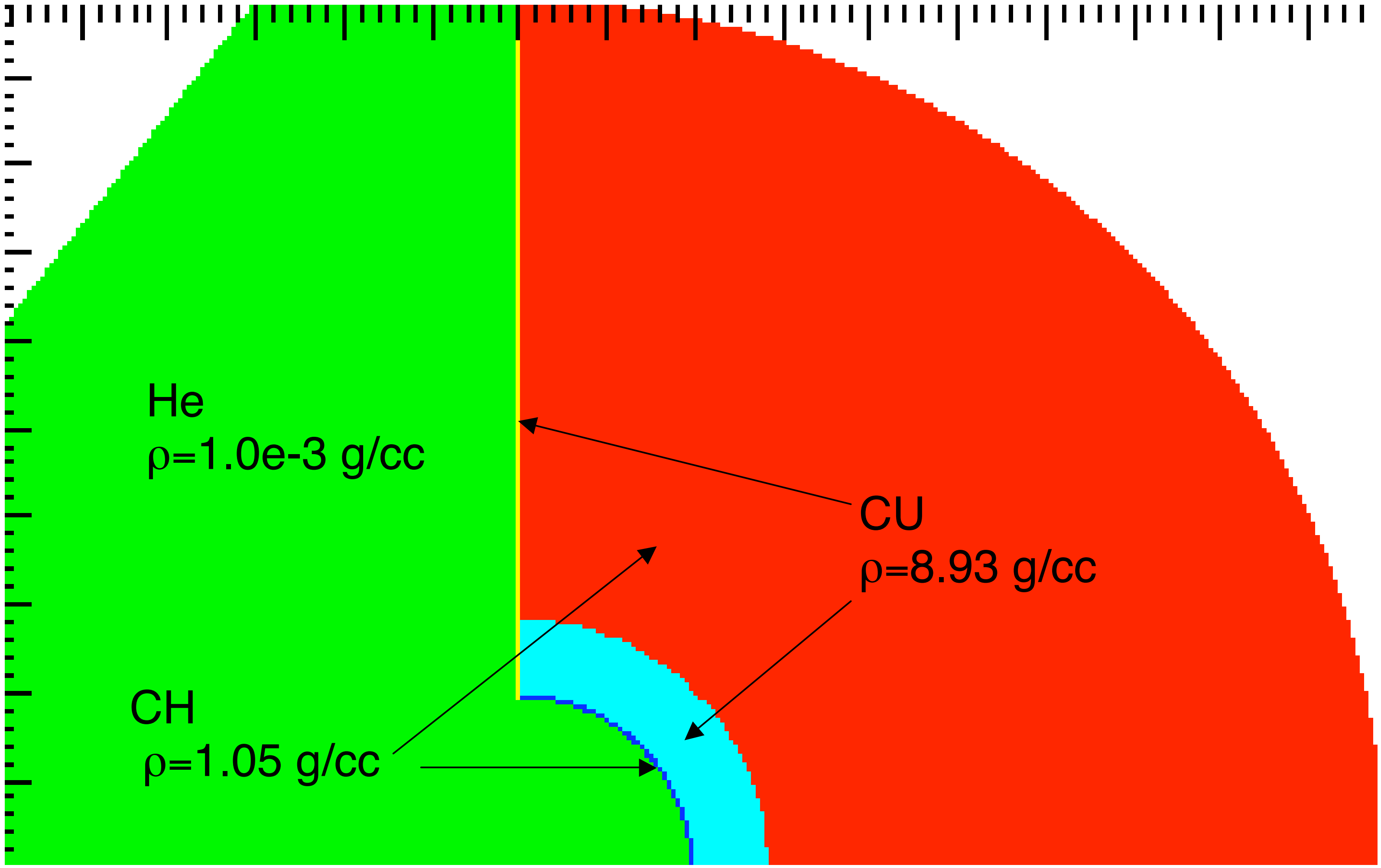


Zoom corner (base) CU shield



Non-uniform grid (242 x 214 zones).
Cylindrical coordinate system

Initial Conditions



Single-mode sinusoidal perturbation

Experimental and Computed Amplitude

Time (ns)	Experiment	Computation
35	23.1	12.0
45	37.4	22.0
55	43.5	26.5
75	101.0	45.0

Method of solution:
CALE (C-based Arbitrary Lagrangian-Eulerian)

- Tabulated EOS for material components
- Rosseland opacities
- Laser energy deposited by ray-tracing beamlets. The beamlets that compose the laser source fan out from the focal point at the origin at an angle of 71 degs from the symmetry axis. The energy deposition pattern on the inner CH surface of the target matches the uniform profile.

Future Work

- Examination of amplitude discrepancy
- Is the drive incorrect?
- Verify energy deposition
- Detailed examination of amplitude
- Comparison to be performed with RAGE